

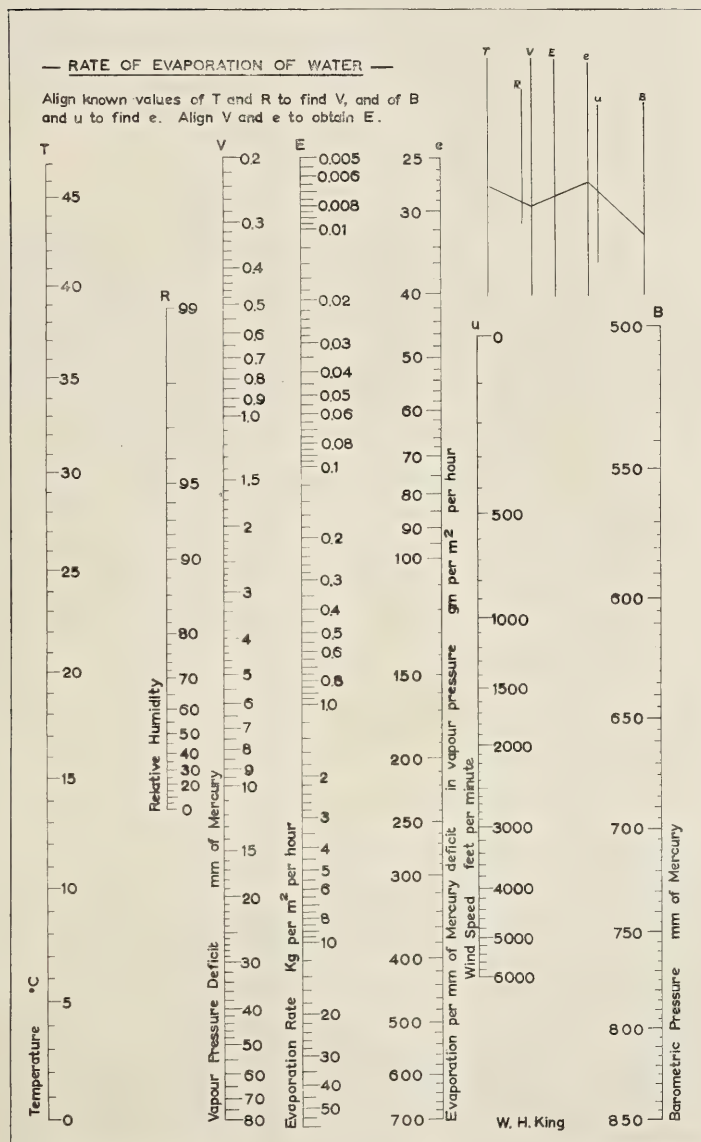


FIG. 1

REFLECTIONS ON THE DEVELOPMENT OF POLLINATION SYSTEMS IN AFRICAN PROTEACEAE

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In a discussion of developmental lines in pollination of South African *Proteaceae* (sub fam. *Persoonioideae*) it is advisable to separate between *Mimetes* and the other genera. There is a very striking difference in gross shoot morphology between them, with the small, lateral inflorescences of *Mimetes* on one hand and the larger, terminal ones of the rest of the genera on the other.

It is difficult to suggest definite developmental lines within the subfamily. The large terminal inflorescences of *Protea* and *Leucadendron* with their specialized involucre certainly represent an advanced stage, whereas the smaller, subterminal inflorescences of *Serruria* and *Diastella* with no or indistinct involucre indicate themselves as being more primitive. If this reasoning is continued, backwards as it were, one should arrive at the conclusion that *Mimetes* should represent an even more primitive stage. This genus is the only one in which the main branch is apparently able to grow on after flowering because the terminal growing point is here not consumed with the formation of the inflorescence, as in the other genera.

An interesting case is represented by *Paranomus*, which has a terminal inflorescence, like the *Protea* type. But this inflorescence—which has no common involucre—is bi-axial, like the *Mimetes* anthocladium, only the bracts are not foliar and do not function after anthesis. The question can be raised if the ordinary terminal inflorescences might also be bi-axial, like that of *Paranomus*, only more compressed. It does not appear to be the case, and even *Spatalla* seems uniaxial, notwithstanding its similarity with *Paranomus*.

The most reasonable developmental lines seem to lead from a branched system of dispersed, small inflorescences (cf. the position of the male inflorescences of *Leucadendron plumosum* cf. Johnson and Briggs 1963 : 56). These, in the simplest case, contracted to the subterminal condition seen in *Mimetes* or, alternatively, to the similar, but terminal position seen in *Paranomus*. Another line of development leads to larger inflorescences, terminal on lateral branches in more primitive genera, terminal on the main branch in *Protea*, *Leucadendron*, etc. When inflorescences are still comparatively small (*Serruria*) a number of flowering lateral branches form underneath last year's inflorescence, but when they are greater (*Protea*, *Orothamnus*), the branching is more sparse, and, on the whole, each main branch only produces one inflorescence.

Another development leads to uni-sexual inflorescences. This seems to be a final refinement, occurring only in genera with a large, terminal inflorescence: *Leucadendron*, *Aulax*. At any rate, these genera must be considered the most highly evolved within the subfamily.

For lack of material, I shall not comment upon *Faurea*. If the shrubby habit of most Cape *Proteaceae* is considered an adaptation to the "Fijnbos climate", the stature of *Faurea* is more in keeping with that of the assumed forest-inhabiting ancestors and in that respect the genus should represent a primitive condition, which is also in keeping with its distribution pattern and assumed antiquity (cf. Levyns 1963). However, its inflorescences are highly evolved: terminal, deciduous catkins. Within *Mimetes*, there is a development from the radiate, not very highly specialized inflorescences of *M. hirta* to those remarkable ones of *M. hartogii*, which have already been described by Vogel (1954 : 183). In this species (and *M. lyrigera*?) the inflorescence is half enclosed by the edges of the bract belonging to the next inflorescence above, bent backwards in such a manner as to form a gullet-shaped pseudanthium, not unlike the one in *Acanthus*, in which, however, the (pseudo-) galea is formed by one of the sepals of the same flower.

The *Mimetes*' bracts are more leaf-like than those of other genera, and, as far as I could make out, the growing point of the flowering branch is not consumed by the formation of flowers, but goes on vegetatively after anthesis. *Mimetes* would then have an anthocladium, not an inflorescence. It is also interesting to see how the bracts of *M. hartogii*, which first are part of the attraction apparatus of the blossom*, later turn green and apparently take over ordinary assimilatory functions.

In *Leucospermum* the terminal inflorescence is loosely organized and functions as a brush blossom. In the more highly developed genera, the progressive development of the inflorescence, especially of an involucre underneath, transforms it into the more primitive bowl-shaped blossom type. In *Leucospermum*, the individual florets constitute the only optical attraction of the brush blossom. In *Telopia* (Australian) the deep red involucre is not very prominent, and the equally strongly coloured florets still form the major means of optical attraction. Within most *Protea* species the involucre gradually takes over this function. In some species, e.g. *P. arborea* or *P. tottum*, the involucre is rather insignificant, and the florets are as important optical attractants as in *Telopia*. In others, like *P. cynaroides*, the involucre is very prominent, and the inflorescence forms a firmly organized bowl-shaped blossom.

This tendency towards the formation of a secondary, open blossom is even more prominent in *Leucadendron*, in which genus the florets, still well developed

* *Blossom* is here used for the functional unit, notwithstanding its morphological value, opposite *flower* which is used as the morphological term, cf. Faegri & v.d. Pijl 1964.